WE CLAIM:

1. A method of reducing a microbial population on poultry during processing comprising:

applying to the poultry during processing a medium chain peroxycarboxylic acid antimicrobial composition in an amount and time sufficient to reduce the microbial population;

the medium chain peroxycarboxylic acid antimicrobial composition comprising:

about 2 to about 500 ppm peroxyoctanoic acid;

about 5 to about 2000 ppm octanoic acid;

about 95 to about 99.99 wt-% water; and

about 2 to about 16,000 ppm polyalkylene oxide, monoalkyl ether of polyalkylene oxide, dialkyl ether of polyalkylene oxide, nonionic surfactant, anionic surfactant, or mixture thereof;

the composition comprising at least about 2 parts by weight of peroxyoctanoic acid for each 7 parts by weight of octanoic acid.

2. A method of recycling water previously applied to poultry, the method comprising:

recovering a medium chain peroxycarboxylic acid antimicrobial composition previously applied to poultry; and

adding to the recovered composition a sufficient amount of a medium chain peroxycarboxylic acid composition to yield a recycled medium chain peroxycarboxylic acid antimicrobial composition;

the added medium chain peroxycarboxylic acid composition comprising:

about 0.0005 to about 5 wt-% peroxyoctanoic acid;

about 0.001 to about 10 wt-% octanoic acid;

about 5 to about 99.99 wt-% water;

about 0.001 to about 60 wt-% polyalkylene oxide, monoalkyl ether of polyalkylene oxide, dialkyl ether of polyalkylene oxide, nonionic surfactant, anionic surfactant, or mixture thereof;

about 0.002 to about 10 wt-% oxidizing agent;

about 0.001 to about 30 wt-% inorganic acid; and

about 0.001 to about 5 wt-% sequestrant;

the composition comprising at least about 2 parts by weight of peroxyoctanoic acid for each 7 parts by weight of octanoic acid.

3. A method of recycling water previously applied to poultry, the method comprising:

recovering a medium chain peroxycarboxylic acid antimicrobial composition previously applied to poultry; and

adding to the recovered composition a sufficient amount of a medium chain peroxycarboxylic acid composition to yield a recycled medium chain peroxycarboxylic acid antimicrobial composition;

the added medium chain peroxycarboxylic acid composition comprising:

about 0.5 to about 5 wt-% peroxyoctanoic acid;

about 1 to about 10 wt-% octanoic acid;

about 5 to about 97 wt-% water;

about 1 to about 20 wt-% anionic surfactant;

about 5 to about 10 wt-% oxidizing agent;

about 15 to about 35 wt-% inorganic acid; and

about 1 to about 5 wt-% sequestrant;

the composition comprising a microemulsion.

4. A method of recycling water previously applied to poultry, the method comprising:

recovering a medium chain peroxycarboxylic acid antimicrobial composition previously applied to poultry; and

adding to the recovered composition a sufficient amount of a medium chain peroxycarboxylic acid composition to yield a recycled medium chain peroxycarboxylic acid antimicrobial composition;

the added medium chain peroxycarboxylic acid composition comprising:

about 0.0005 to about 5 wt-% peroxyoctanoic acid;

about 0.001 to about 10 wt-% octanoic acid;

about 40 to about 99.99 wt-% water;

about 0.001 to about 60 wt-% polyalkylene oxide, monoalkyl ether of polyalkylene oxide, dialkyl ether of polyalkylene oxide, anionic surfactant, nonionic surfactant, or mixture thereof, or mixture thereof;

about 0.002 to about 10 wt-% oxidizing agent;

about 0.001 to about 30 wt-% inorganic acid; and

about 0.001 to about 5 wt-% sequestrant.

5. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.0005 to about 5 wt-% peroxyoctanoic acid;

about 0.001 to about 10 wt-% octanoic acid;

about 5 to about 99.99 wt-% water;

about 0.001 to about 60 wt-% polyalkylene oxide, monoalkyl ether of polyalkylene oxide, dialkyl ether of polyalkylene oxide, nonionic surfactant, anionic surfactant, or mixture thereof;

about 0.002 to about 10 wt-% oxidizing agent;

about 0.001 to about 30 wt-% inorganic acid; and

about 0.001 to about 5 wt-% sequestrant;

the composition comprising at least about 2 parts by weight of peroxyoctanoic acid for each 7 parts by weight of octanoic acid.

6. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.5 to about 5 wt-% peroxyoctanoic acid;

about 1 to about 10 wt-% octanoic acid;

about 5 to about 97 wt-% water;

about 1 to about 20 wt-% anionic surfactant;

about 5 to about 10 wt-% oxidizing agent;

about 15 to about 35 wt-% inorganic acid; and

about 1 to about 5 wt-% sequestrant;

the composition comprising a microemulsion.

7. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.0005 to about 5 wt-% peroxyoctanoic acid;

about 0.001 to about 10 wt-% octanoic acid;

about 40 to about 99.99 wt-% water;

about 0.001 to about 60 wt-% polyalkylene oxide, monoalkyl ether of polyalkylene oxide, dialkyl ether of polyalkylene oxide, anionic surfactant, nonionic surfactant, or mixture thereof, or mixture thereof;

about 0.002 to about 10 wt-% oxidizing agent;

about 0.001 to about 30 wt-% inorganic acid; and

about 0.001 to about 5 wt-% sequestrant.

8. A method of reducing a microbial population on poultry during processing comprising:

applying to the poultry during processing a medium chain peroxycarboxylic acid antimicrobial composition in an amount and time sufficient to reduce the microbial population.

9. The method of claim 8, wherein the poultry being processed comprises chicken, turkey, ostrich, game hen, squab, guinea fowl, pheasant, duck, goose, emu, or a combination thereof.

10. The method of claim 8, comprising applying the medium chain peroxycarboxylic acid composition by submersing the poultry.

11. The method of claim 10, comprising applying the medium chain peroxycarboxylic acid composition by submersion scalding, by submersion chilling, by hydro-cooling or chilling, tumble immersion, or by a combination thereof.

12. The method of claim 10, comprising applying the medium chain peroxycarboxylic acid composition for a duration and at a concentration selected to yield visually imperceptible darkening of subcutaneous bruises, pooled blood, or a combination thereof.

13. The method of claim 8, comprising applying the medium chain peroxycarboxylic acid composition by rinsing or spraying the poultry.

14. The method of claim 13, comprising applying the medium chain peroxycarboxylic acid composition with a de-feathering picker, by inside-outside bird washing, by dress rinsing, by spray rinsing, or a combination thereof.

15. The method of claim 8, comprising applying the medium chain peroxycarboxylic acid composition to a whole poultry carcass.

16. The method of claim 15, comprising applying the medium chain peroxycarboxylic acid composition to a poultry carcass that has been subjected to stunning, bleeding, scalding, picking, singeing, or a combination thereof.

17. The method of claim 8, comprising applying the medium chain peroxycarboxylic acid composition to one or more dismembered parts of a poultry carcass.

18. The method of claim 17, comprising applying the medium chain peroxycarboxylic acid composition to a poultry carcass that has been subjected to beheading, removing feet, eviscerating, neck-cropping, portioning, or a combination thereof.

19. The method of claim 18, comprising applying the medium chain peroxycarboxylic acid composition to a poultry leg, thigh, breast quarter, wing, or combination thereof of a poultry that has been subjected to portioning.

20. The method of claim 17, comprising applying the medium chain peroxycarboxylic acid composition to a poultry that has also been subjected to boning.

21. The method of claim 20, comprising applying the medium chain peroxycarboxylic acid composition to a boned poultry leg, thigh, breast, wing, or combination thereof.

22. The method of claim 8, comprising applying the medium chain peroxycarboxylic acid composition by air chilling.

23. The method of claim 22, wherein the medium chain peroxycarboxylic acid composition comprises peroxyoctanoic acid.

24. The method of claim 22, wherein air chilling comprises applying a gaseous or densified fluid antimicrobial composition.

25 25 The method of claim 8, further comprising exposing the poultry to activated light.

26. The method of claim 25, wherein the activated light comprises ultraviolet light, infrared light, visible light, or a combination thereof.

27. The method of claim 8, wherein the medium chain peroxycarboxylic acid antimicrobial composition comprises:

about 2 to about 500 ppm medium chain peroxycarboxylic acid;

about 5 to about 2000 ppm medium chain carboxylic acid;

about 95 to about 99.99 wt-% water; and

about 2 to about 16,000 ppm solubilizer.

28. The method of claim 27, wherein the medium chain peroxycarboxylic acid antimicrobial composition further comprises stabilizing agent, wetting agent, thickener, foaming agent, acidulant, pigment, dye, or a combination thereof.

29. The method of claim 8, wherein the microbial population is the result of contamination by fecal matter or digestive tract content.

30. The method of claim 29, wherein the microbial population is reduced in a continuous online process.

31. The method of claim 8, further comprising, after applying:

recovering the applied medium chain peroxycarboxylic acid antimicrobial composition; and

adding to the recovered composition a sufficient amount of a medium chain peroxycarboxylic acid to yield a recycled medium chain peroxycarboxylic acid antimicrobial composition.

32. The method of claim 31, further comprising applying the recycled composition to poultry during processing.

33. The method of claim 31, wherein the medium chain peroxycarboxylic acid comprises:

about 0.5 to about 5 wt-% medium chain peroxycarboxylic acid;

about 1 to about 10 wt-% medium chain carboxylic acid;

about 5 to about 97 wt-% water; and

about 1 to about 20 wt-% microemulsion former;

the composition comprising a microemulsion.

34. The method of claim 31, wherein the medium chain peroxycarboxylic acid comprises:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 0 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid;

the composition comprising about 2 or more parts by weight of medium chain peroxycarboxylic acid for each 7 parts by weight of medium chain carboxylic acid.

35. The method of claim 31, wherein the medium chain peroxycarboxylic acid comprises:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 40 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid.

36. The method of claim 31, wherein the recycled medium chain peroxycarboxylic acid antimicrobial composition comprises:

about 2 to about 500 ppm medium chain peroxycarboxylic acid;

about 5 to about 2000 ppm medium chain carboxylic acid;

about 95 to about 99.99 wt-% water; and

about 2 to about 16,000 ppm solubilizer.

37. A method of recycling water previously applied to poultry, the method comprising:

recovering a medium chain peroxycarboxylic acid antimicrobial composition previously applied to poultry; and

adding to the recovered composition a sufficient amount of a medium chain peroxycarboxylic acid to yield a recycled medium chain peroxycarboxylic acid antimicrobial composition.

38. The method of claim 37, further comprising applying the recycled composition to poultry during processing.

39. The method of claim 37, wherein the medium chain peroxycarboxylic acid composition comprises:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 0 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid;

the composition comprising about 2 or more parts by weight of medium chain peroxycarboxylic acid for each 7 parts by weight of medium chain carboxylic acid.

40. The method of claim 37, wherein the medium chain peroxycarboxylic acid composition comprises:

about 0.5 to about 5 wt-% medium chain peroxycarboxylic acid;

about 1 to about 10 wt-% medium chain carboxylic acid;

about 5 to about 97 wt-% water; and

about 1 to about 20 wt-% microemulsion former;

the composition comprising a microemulsion.

41. The method of claim 37, wherein the medium chain peroxycarboxylic acid composition comprises:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 40 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid.

42. The method of claim 37, wherein the composition was previously applied by a carcass wash or rinse.

43. The method of claim 37, wherein the composition was previously applied by an inside-outside bird wash.

44. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.5 to about 5 wt-% medium chain peroxycarboxylic acid;

about 1 to about 10 wt-% medium chain carboxylic acid;

about 5 to about 97 wt-% water; and

about 1 to about 20 wt-% microemulsion former;

the composition comprising a microemulsion.

45. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 0 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid;

the composition comprising about 2 or more parts by weight of medium chain peroxycarboxylic acid for each 7 parts by weight of medium chain carboxylic acid.

46. An antimicrobial concentrate composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 0.0005 to about 5 wt-% medium chain peroxycarboxylic acid;

about 0.001 to about 10 wt-% medium chain carboxylic acid;

about 40 to about 99.99 wt-% water; and

about 0.001 to about 80 wt-% solubilizer effective for solubilizing the medium chain peroxycarboxylic acid and the medium chain carboxylic acid.

47. An antimicrobial use composition comprising:

a medium chain peroxycarboxylic acid composition effective for reducing the microbial burden on a surface of poultry;

the composition comprising:

about 2 to about 500 ppm medium chain peroxycarboxylic acid;

about 5 to about 2000 ppm medium chain carboxylic acid;

about 95 to about 99.99 wt-% water; and

about 2 to about 16,000 ppm solubilizer.

48. A method of reducing a microbial population on poultry processing surface, the method comprising:

applying to the poultry processing surface medium chain peroxycarboxylic acid antimicrobial composition in amount and for time sufficient to reduce the microbial population.